Claims

What is claimed is:

1. A method for filtering a signal comprising:
   a) calculating each filter coefficient for a combined time invariant finite impulse response (FIR) filter and a time variant FIR filter;
   b) storing each filter coefficient in a memory array in addressable groups corresponding to a filtering period; and
   c) filtering data to implement the combined time invariant FIR filter and time variant FIR filter using a polyphase decomposition of the filter coefficients to create an output signal.

2. The method of claim 1 wherein the time invariant FIR filter response provides filtering based on a channel estimate.

3. The method of claim 2 wherein the time variant FIR filter provides filtering based on at least one of the group consisting of spreading and scrambling.

4. The method of claim 1 wherein filter calculations occur at a lower sampling rate and the output signal is provided at a higher sampling rate.

5. The method of claim 1 wherein the data is downsampled prior to filtering such that filter calculations occur at a lower sampling rate.

6. The method of claim 1 wherein the coefficients for the combined time invariant FIR filter and time variant FIR filter are calculated to emulate a time

variant FIR filter preceding a time variant FIR filter.

7. The method of claim 6 wherein $a_k(n)$ represents coefficients for the time variant FIR filter, $b_{m-k}(n)$ represents the coefficients for the time invariant FIR filter, $c_m(n)$ represents the coefficients for the combined time invariant FIR filter and time variant FIR filter and values for $c_m(n)$ are calculated as follows: $$c_m(n) = \sum_{k=\max(0,m-N_f)}^{\min(m,N_v)} a_k(n-m+k)b_{m-k}$$ wherein N_v represents an order of the time variant FIR filter and N_f represents an order of the time invariant FIR filter.

8. The method of claim 7 wherein the memory array includes $T_{VARIATION}$ rows and $N_v + N_f + 1$ columns and $T_{VARIATION}$ is the product of R and P wherein there are R sets of values for the time variant coefficients, $a_k(n)$, and the values of $a_k(n)$ change every P sample periods.

9. The method of claim 8 wherein the filtering step further comprises selecting each of the coefficients for the combined time invariant FIR filter and time variant FIR filter, $c_m(n)$, from the memory array using a common index.

10. The method of claim 9 wherein the memory index is initialized to a first row in the memory array and incremented one row each sample period.

11. The method of claim 1 wherein the coefficients for the combined time invariant FIR filter and time

variant FIR filter are calculated to emulate a time variant FIR filter following a time variant FIR filter.

12. The method of claim 1 wherein $a_k(n)$ represents coefficients for the time variant FIR filter, $b_{m-k}(n)$ represents the coefficients for the time invariant FIR filter, $c_m(n)$ represents the coefficients for the combined time invariant FIR filter and the time variant FIR filter and values for $c_m(n)$ are calculated as follows: $$c_m(n) = \sum_{k=\max(0,m-N_f)}^{\min(m,N_v)} a_k(n) b_{m-k}$$ wherein N_v represents an order of the time variant FIR filter and N_f represents an order of the time invariant FIR filter.

13. The method of claim 12 wherein the memory array includes R rows and $N_v + N_f + 1$ columns wherein there are R sets of values for the time variant coefficients, $a_k(n)$, and the values of $a_k(n)$ change every P sample periods.

14. The method of claim 13 wherein the filtering step further comprises selecting each of the coefficients for the combined time invariant FIR filter and time variant FIR filter, $c_m(n)$, from the memory array using a common index.

15. The method of claim 14 wherein the memory index is initialized to a first row in the memory array and incremented one row each sample period.

16. The method of claim 1 further comprising:

a) receiving an input signal over a select period, the input signal including a plurality of user signals;

b) for each user signal, subtracting individual regenerated signals corresponding to all other user signals from the input signal to create an individual signal;

c) demodulating each individual signal to provide a corresponding demodulated individual signal;

d) processing each demodulated individual signal to determine symbol estimates for each symbol included therein; and

e) creating the individual regenerated signals from the symbol estimates using the calculating, storing and filter steps.

17. A transceiver comprising:

a) receiving circuitry for receiving and downconverting a transmitted signal to provide a downconverted signal; and

b) a baseband processor adapted to receive the downconverted signal and:

i) calculate each filter coefficient for a combined time invariant finite impulse response (FIR) filter and time variant FIR filter;

ii) store each filter coefficient in a memory array in addressable groups corresponding to a filtering period; and

iii) filter data in the downconverted signal with the combined time invariant FIR filter and time variant FIR filter using a polyphase decomposition of the filter coefficients to create an output signal.

a) receiving an input signal over a select period, the input signal including a plurality of user signals;

b) for each user signal, subtracting individual regenerated signals corresponding to all other user signals from the input signal to create an individual signal;

c) demodulating each individual signal to provide a corresponding demodulated individual signal;

d) processing each demodulated individual signal to determine symbol estimates for each symbol included therein; and

e) creating the individual regenerated signals from the symbol estimates using the calculating, storing and filter steps.

17. A system comprising:

a) receiving circuitry for receiving and downconverting a transmitted signal to provide a downconverted signal; and

b) a baseband processor adapted to receive the downconverted signal and:

i) calculate each filter coefficient for a combined time invariant finite impulse response (FIR) filter and time variant FIR filter;

ii) store each filter coefficient in a memory array in addressable groups corresponding to a filtering period; and

iii) filter data in the downconverted signal with the combined time invariant FIR filter and time variant FIR filter using a polyphase decomposition of the filter coefficients to create an output signal.

18. The system of claim 17 wherein the time invariant FIR filter response provides filtering based on a channel estimate.

19. The system of claim 17 wherein the time variant FIR filter provides filtering based on at least one of the group consisting of spreading and scrambling.

20. The system of claim 17 wherein filter calculations occur at a lower sampling rate and the output signal is provided at a higher sampling rate.

21. The system of claim 17 wherein the data is downsampled prior to filtering such that filter calculations occur at a lower sampling rate.

22. The system of claim 17 wherein the coefficients for the combined time invariant FIR filter and time variant FIR filter are calculated to emulate a time variant FIR filter preceding a time invariant FIR filter.

23. The system of claim 22 wherein $a_k(n)$ represents coefficients for the time variant FIR filter, $b_{m-k}(n)$ represents the coefficients for the time invariant FIR filter, $c_m(n)$ represents the coefficients for the combined time invariant FIR filter and time variant FIR filter and values for $c_m(n)$ are calculated as follows: $c_m(n) = \sum_{k=\max(0,m-N_f)}^{\min(m,N_v)} a_k(n-m+k) b_{m-k}$, wherein N_v represents an order of the time variant FIR filter and N_f represents an order of the time invariant FIR filter.

24. The system of claim 23 wherein the memory array includes $T_{VARIATION}$ rows and $N_v + N_f + 1$ columns and $T_{VARIATION}$ is the product of R and P wherein there are R sets of values for the time variant coefficients, $a_k(n)$, and the values of $a_k(n)$ change every P sample periods.

25. The system of claim 24 wherein during filtering the baseband processor is further adapted to select each of the coefficients for the combined time invariant FIR filter and the time variant FIR filter, $c_m(n)$, are selected from the memory array using a common index.

26. The system of claim 25 wherein the common index is initialized to a first row in the memory array and incremented one row each sample period.

27. The system of claim 17 wherein the coefficients for the combined time invariant FIR filter and time variant FIR filter are calculated to emulate a time variant FIR filter following a time invariant FIR filter.

28. The system of claim 27 wherein $a_k(n)$ represents coefficients for the time variant FIR filter, $b_{m-k}(n)$ represents the coefficients for the time invariant FIR filter, $c_m(n)$ represents the coefficients for the combined time invariant FIR filter and time variant FIR filter and values for $c_m(n)$ are calculated as follows:

$$c_m(n) = \sum_{k=\max(0,m-N_f)}^{\min(m,N_v)} a_k(n) b_{m-k} ,$$

wherein N_v represents an order of the time variant FIR filter and N_f represents an order of the time invariant FIR filter.

29. The system of claim 28 wherein the memory array includes R rows and $N_v + N_f + 1$ columns wherein there are R sets of values for the time variant coefficients, $a_k(n)$, and the values of $a_k(n)$ change every P sample periods.

30. The system of claim 29 wherein during filtering the baseband processor is further adapted to select each of the coefficients for the combined time invariant FIR filter and time variant FIR filter, $c_m(n)$, are selected from the memory array using a common index.

31. The system of claim 30 wherein the common index is initialized to a first row in the memory array and incremented one row each sample period.

32. The system of claim 31 wherein the downconverted signal is received over a select period and includes a plurality of user signals and the baseband processor is further adapted to:

a) for each user signal, subtract individual regenerated signals corresponding to all other user signals from the input signal to create an individual signal;

b) demodulate each individual signal to provide a corresponding demodulated individual signal;

c) process each demodulated individual signal to determine symbol estimates for each symbol included therein; and

d) create the individual regenerated signals from the symbol estimates using the calculate, store and filter functions.

33. A system for filtering a signal comprising:

a) means for calculating each filter coefficient for a combined time invariant finite impulse response (FIR) filter and time variant FIR filter wherein the time invariant FIR filter response provides filtering based on a channel estimate and the time variant FIR filter provides filtering based on at least one of the group consisting of spreading and scrambling;

b) means for storing each filter coefficient in a memory array in addressable groups corresponding to a filtering period; and

c) means for filtering symbols to implement the combined time invariant FIR filter and time variant FIR filter using a polyphase decomposition of the filter coefficients to create a regenerated signal wherein filter calculations occur at a lower sampling rate and the regenerated signal is provided at a higher sampling rate.